UNITED STATES PATENT AND TRADEMARK OFFICE

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EXAMINER
PROCTOR, JASON SCOTT

ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 09/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☐ Responsive to communication(s) filed on _____ .

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-19* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-19* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☒ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on <u>07 May 2001</u> is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>23 Jul 2002</u>.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____ .

DETAILED ACTION

1.   Claims 1-19 have been rejected.

Priority

2.   Applicant's claim for domestic priority under 35 U.S.C. 119(e) is
acknowledged. A priority date of May 5, 2000 has been granted according to
provisional application number 60/202,154.

Specification

3.   The disclosure is objected to because of the following informalities:
Several words are misspelled, such as "attempots" (paragraph 0004, line 4),
"levewls" (paragraph 0005, line 2), and "rested" (paragraph 0006, line 3) is
presumed to be "nested".

        Appropriate correction is required.

4.   The disclosure is objected to because of the following informalities: The
use of the term "rate" in paragraph 0031 contradicts the known definition and
does not provide an explicit redefinition. Rate: A quantity measured with respect
to another measured quantity (The American Heritage® Dictionary of the English
Language: Fourth Edition). The term "rate" is implicitly redefined as a measure
of time (paragraph 0031, lines 2-3) and again as a frequency (paragraph 0031,
lines 4-5), where "Hz" is interpreted as the abbreviation for Hertz. Hertz: A unit of
frequency equal to one cycle per second (The American Heritage® Dictionary of
the English Language: Fourth Edition). The term "rate" is implicitly redefined

numerous times in the specification, as in paragraphs 0033, 0035, and 0037. As it is unclear whether "rate" is intended to be a measure of time, a measure of frequency, or a ratio according to the known definition and examiner's interpretation of the intended use in the specification, examiner interprets "rate" according to the known definition.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

5.   The following is a quotation of the second paragraph of 35 U.S.C. §112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6.   Claims 1-5, 8-15, 17 and 18 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7.   Regarding claim 1, it is unclear what is meant by "platform model". It is unclear what is meant by "platform".

8.   Regarding claims 4 and 8, the claims do not end with a period. See MPEP 608.01(m).

9.   Regarding claims 8 and 18, it is unclear what is meant by "warm recoverable errors". It is unclear what is meant by "warm recoverable error state parameters". It is unclear what is meant by "non-warm recoverable errors". It is unclear what is meant by "non-warm recoverable error state parameters".

10.   Regarding claims 9, 11 and 17, it is unclear what is meant by "determining a fraction of recovery failures". Several interpretations exist, some of which are

"using some input data to predict that a certain fraction of recovery attempts will fail," or "observing that some recovery attempts have failed and representing the ratio of failed to successful attempts as a fraction," or "determining beforehand that a certain number of the recovery attempts will be simulated as failures to correct the error," or "determining which recovery failures among all recovery failures relate to a specific error".

11.   The term "a fraction of recovery failures" in claims 9, 10, 11 and 17 is a relative term which renders the claim indefinite. The term "a fraction of recovery failures" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Examiner observes that all rational numbers are defined by their ability to be represented as a fraction.

12.   Claim 10 recites the limitation "said first generating step" in line 1. There is insufficient antecedent basis for this limitation in the claim. Examiner suggests "the generation of warm recoverable error state parameters".

13.   Any claim rejected but not specifically mentioned is rejected by virtue of its dependence.

Claim Interpretation

14.   Regarding claim 1, the term "platform" is interpreted as "computer or network hardware that includes software" according to "Nodes 102, 110, 120 and 130 may be computers, or any platform that has hardware and software components" (paragraph 0017, lines 3-5).

15.   Regarding claim 8, the term "warm recoverable errors" is interpreted as "software error" according to "Thus, software availability may be impacted by errors that result in recovery actions in the applications, or warm recoverable, or errors that result in recovery actions on the node or cluster, or non-warm recoverable" (paragraph 0064).

16.   The term "non-warm recoverable errors" is interpreted as "hardware error" according to "Thus, software availability may be impacted by errors that result in recovery actions in the applications, or warm recoverable, or errors that result in recovery actions on the node or cluster, or non-warm recoverable" (paragraph 0064) and "Nodes 102, 110, 120, and 130 may be computers, or any platform that has hardware and software components (paragraph 0017, lines 3-5).

17.   The term "warm recoverable error state parameters" is interpreted as "software error rate and time to recover" according to paragraph 0056 and paragraph 0064 as above.

18.   The term "non-warm recoverable error state parameters" is interpreted as "hardware error rate and time to recover" according to paragraph 0057 and paragraphs 0064 and 0017, lines 3-5 as above.

19.   Regarding claim 9, 10 and 17 the term "a fraction of recovery failures" is

interpreted as "a percentage of recovery attempts that failed" according to

paragraph 0031, lines 5-9.

Claim Rejections - 35 USC § 102

20.   The following is a quotation of the appropriate paragraphs of 35

U.S.C. §102 that form the basis for the rejections under this section made in this

Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

21.   Claims 1-5, 16, and 19 are rejected under 35 U.S.C. §102(e) as being

anticipated by Zager et al. (US 006393386 B1)

22.   Regarding claim 1, Zager et al. discloses a method of modeling a complex

system, such as a distributed computing ensemble, wherein

platforms with at least one software component are modeled (column 3,

lines 4-11; column 8, lines 35-38; column 8, lines 42-43),

failures are modeled (column 5, line 63 – column 6, line 7; column 11,

lines 17-23),

recovery from failures are modeled (column 11, lines 18-23),

the failures belong to different classes (column 7, lines 4-18) including root

causes, non-root causes, and performance degradation failures,

a platform is modeled (column 5, lines 23-28; column 8, lines 36-38;

column 8, lines 42-43), and

the model includes an aggregate failure rate and aggregate repair time for

each of said classes of failures in the form of aggregate fault and

impact data (column 11, lines 10-16).

23.   Regarding claim 2, Zager et al. discloses modeling different platforms

(column 3, lines 4-11; column 8, lines 35-38; column 8, lines 42-43). It is

deemed inherent that platforms parameters are required to model a platform.

24.   Regarding claim 3, Zager et al. discloses modeling hardware components

(column 3, lines 4-11; column 3, lines 17-21; column 3, lines 48-54).

25.   Regarding claim 4, it is deemed inherent that the mean time to repair

includes time to detect and identify an error. The time to detect and identify an

error has an impact on the availability of the network resources. It is a stated

goal of Zager et al. to monitor and model the state of network resources as well

as the impacts of events, which are faults and recovery from faults, therein

(column 2, line 64 – column 3, line 3).

26.   Regarding claim 5, Zager et al. discloses that the platforms are nodes in a

network (column 8, lines 35-50).

27.   Regarding claim 16, Zager et al. discloses a method of modeling a

complex system, such as a distributed computing ensemble, wherein

events such as failures and performance degradations are represented in

the model (column 5, lines 63-64; column 11, lines 18-22),

a recoverable state, represented as root or non-root, is determined for

said event (column 7, lines 4-18; column 31, line 54 – column 32,

line 40),

a failure rate and recovery rate is determined for said event (column 3,

lines 36-47), and

event data is incorporated into the recoverable state data (column 3, lines

4-11; column 3, lines 36-47).

28.   Regarding claim 19, Zager et al. discloses a method of modeling a
complex system, such as a distributed computing ensemble, wherein

the model is a software model (column 3, lines 28-31),

events such as failures and performance degradations are represented in

the model (column 5, lines 63-64; column 11, lines 18-22),

a recoverable state, represented as root or non-root, is determined for

said event (column 7, lines 4-18; column 31, line 54 – column 32,

line 40),

a failure rate and recovery rate is determined for said event (column 3,

lines 36-47), and

event data is incorporated into the recoverable state data (column 3, lines

4-11; column 3, lines 36-47).

Claim Rejections - 35 USC § 103

29.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for
all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

30.   Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zager et al. (US 006393386 B1) in view of Cristian.

Regarding claim 6, Zager et al. discloses a method and system for modeling a complex system such as a distributed computing ensemble wherein

at least one node is modeled (column 8, lines 2-7; column 8, lines 42-43; column 8, lines 44-50),

services, both computational and functional, represent software (column 9, line 55 – column 10, line 5), and

a software availability model (column 11, lines 10-16) includes an aggregated failure rate and an aggregated repair time for each software component (column 11, lines 10-16) as taught by categorization of reliability according to service.

31.   Zager et al. does not disclose modeling errors and recoveries at a level of detail including reboot times.

32.   Cristian teaches a framework for fault-tolerant distributed computing systems including various hardware and software failures exhibited by such systems. In particular, Cristian teaches the importance of early timing failures and late timing failures, grouped as performance failures (page 58, column 2, line 60 – column 3, line 7). Cristian also teaches the importance of crash failures, which require that a server restarts with potential loss of state or data (page 58,

column 3, lines 13-35). Servers can be implemented in hardware or software (page 57, column 3, lines 23-34).

33.   The combination of a crash error in a hardware server, which requires the server to restart, and performance failure data defining the timing window in which a server should perform a restart action constitute a reboot time. Thus, Cristian teaches the use of a reboot time to detect errors in a distributed computing system.

34.   It would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to incorporate the reboot time parameters in the node model of an availability model because a node is not available during the reboot sequence and monitoring reboot times is a simple and known method of checking for unusual operation during the reboot process.

35.   The combination of the reboot time parameter to the node model of Zager et al. would be easily achieved by marking the time when a service begins a reboot sequence and subsequently polling the service at the beginning and end of the timing window. In effect, checking for early timing failures and late timing failures. Incorporating such a feature into the invention of Zager et al. would produce a network model with the ability to detect a wider range of typical errors.

36.   Regarding claim 7, Zager et al. discloses that managed resources, including hardware components, may suffer faults or performance degradations (column 12, lines 23-27) that are of interest to the model (column 11, lines 42-46). It is deemed inherent that these hardware components are modeled corresponding to the node models.

37.   Claims 8-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zager et al. (US 006393386 B1) in view of Cristian.

38.   Regarding claim 8, Zager et al. discloses a system for modeling complex networks, such as a distributed computing ensemble, and predicting the impacts of faults therein where hardware and software resources are modeled (column 3, lines 4-11). Zager et al. also models the recovery from faults. Faults and recoveries from faults are modeled as events (column 11, lines 18-23). Zager et al. discloses determining whether an error is a root cause or non-root cause error (column 7, lines 4-18; column 31, line 54 – column 32, line 40).

39.   Zager et al. does not disclose modeling errors and recoveries at a level of detail including warm recoverable errors or non-warm recoverable errors. Zager et al. does not disclose the use of parameters related to warm recoverable errors or non-warm recoverable errors.

40.   Cristian teaches a framework for fault-tolerant distributed computing systems including various hardware and software failures exhibited by such systems. In particular, Cristian teaches that servers may be implemented in hardware or software (page 57, column 3, lines 23-34) and the concept of warm recoverable errors (partial-amnesia crash and pause-crash) as well as non-warm recoverable errors (amnesia crash) (page 58, column 3, lines 13-34). Cristian also teaches the importance of performance failures, specifically early timing failures and late timing failures (page 58, column 2, line 60 – column 3, line 7),

which teach the recovery rates for warm and non-warm recoverable errors when applied to the recovery procedures following crash failures.

41.   It would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to incorporate these failures and corresponding data into the system for modeling complex networks, such as distributed computing ensembles, because it was known that different errors had different characteristics and recovery procedures and a goal of modeling a complex system is to represent its performance as accurately as possible.

42.   The combination of these errors with the invention of Zager, et al. would be easily achieved by incorporating them as additional data in the root cause determination or performance degradation failure states, as well as the parameters and state data necessary to model the warm recoverable errors and non-warm recoverable errors. Incorporating such a feature into the invention of Zager et al. would produce a network model with higher fidelity regarding the actual complex network.

43.   Regarding claim 9, Zager et al. models both hardware and software components (column 3, lines 4-11). Both hardware and software components experience faults (column 12, lines 23-32). Thus, Zager et al. teaches recovery attempts for software errors that fail 0% of the time.

44.   Regarding claim 10, Zager et al. teaches recovery attempts for software errors that fail 0% of the time as rejected for claim 9. Zager et al. also teaches the determination of an event as root cause or non-root cause (column 7, lines 4-18; column 31, line 54 – column 32, line 40). The percentage of recoveries that

fail is in intrinsic property of the recovery attempts and therefore does not require a dedicated operation by the invention of Zager et al. Thus Zager et al. teaches generating the percentage of recovery attempts that fail in the same step as generating the state parameters.

45.   Regarding claim 11, Zager et al. teaches modeling events, which is a fault or the recovery from a fault (column 11, lines 18-23). Zager et al. models both hardware and software components (column 3, lines 4-11). Both hardware and software components experience faults (column 12, lines 23-32). Thus, Zager et al. teaches recovery attempts for hardware errors that fail 0% of the time.

46.   Regarding claim 12, Zager et al. teaches recovery attempts for hardware errors that fail 0% of the time as rejected for claim 11. Zager et al. also teaches the determination of an event as root cause or non-root cause (column 7, lines 4-18; column 31, line 54 – column 32, line 40). The percentage of recoveries that fail is in intrinsic property of the recovery attempts and therefore does not require a dedicated operation by the invention of Zager et al. Thus Zager et al. teaches generating the percentage of recovery attempts that fail in the same step as generating the state parameters.

47.   Regarding claim 13, node recovery parameters are deemed synonymous with non-warm recoverable errors, referred to by Cristian as an amnesia crash (page 58, column 3, lines 13-34), in combination with performance errors (page 58, column 2, line 60 – column 3, line 7), which provide a timing window by which recovery from a non-warm recoverable error can be measured. The motivation for this combination is given in the rejection of claim 8 above.

48.   Regarding claim 14, node recovery parameters are deemed synonymous with non-warm recoverable errors, referred to by Cristian as an amnesia crash (page 58, column 3, lines 13-34), in combination with performance errors (page 58, column 2, line 60 – column 3, line 7), which provide a timing window by which recovery from a non-warm recoverable error can be measured. Cristian teaches that servers may be hardware or software (page 57, column 3, lines 23-34). The recovery from an amnesia crash experienced by a server implemented in hardware is deemed synonymous with a reboot procedure. The performance data related to the reboot procedure constitutes node reboot parameters. The motivation for this combination is given in the rejection of claim 8 above.

49.   Regarding claim 15, Zager et al. teaches that various software components acquire information relating to the operation of the external system and report changes of state in the modeled components to the model (column 6, line 62 – column 7, line 1). The external system is the complex network of computing devices (column 5, lines 48-50). It is deemed inherent that when the network or a portion of the network reboots, the software components that acquire information relating to the operation of the external system detect this change of state and report the relevant parameters to the model.

50.   Claim 17 is rejected under 35 U.S.C. §103(a) as being unpatentable over Zager et al. (US 006393386 B1) as applied to claim 16 above, and further in view of Cristian.

51.   Zager et al. does not explicitly teach modeling recovery failures except as inherent in the mean time to recover statistic.

52.   Cristian teaches a framework for fault-tolerant distributed computing systems including various hardware and software failures exhibited by such systems. In particular, Cristian teaches response failures which correspond to situations where the server's state transition is incorrect (page 58, column 3, lines 7-13). This type of response failure is deemed synonymous with a recovery failure that is intended to model misdiagnosis of the failure, a corruption in the checkpoint stored for the application, and miscellaneous failures to restart (instant application, paragraph 0031, lines 6-9).

53.   It would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to make this combination because metrics for the reliability of distributed computing including software, hardware, and recovery failures were known in the art. In building a model for such a system, it would have been obvious to incorporate the established metrics for such a system in the model.

54.   The combination of response failures from Cristian with the method of modeling a complex system of Zager et al. would be easily produced by including a response failure as an additional type of event. Zager et al. currently models faults and recovery from those faults. The combination would allow for recovery attempts that fail to correct the fault and subsequently the object experiencing a fault would not transition to a recovered state. Such a combination would

produce an availability model that represents an actual computer network with greater fidelity.

55.   Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zager et al. (US 006393386 B1) in view of Cristian.

56.   Zager et al. discloses a system for modeling complex networks, such as a distributed computing ensemble, and predicting the impacts of faults therein where hardware and software resources are modeled (column 3, lines 4-11). Zager et al. also models the recovery from faults (column 11, lines 18-23). Zager et al. teaches that the model is a software model (column 3, lines 28-31).

57.   Zager et al. does not disclose modeling errors and recoveries at a level of detail including warm recoverable errors or non-warm recoverable errors. Zager et al. does not disclose the use of parameters related to warm recoverable errors or non-warm recoverable errors.

58.   Cristian teaches a framework for fault-tolerant distributed computing systems including various hardware and software failures exhibited by such systems. In particular, Cristian teaches that servers may be implemented in hardware or software (page 57, column 3, lines 23-34) and the concept of warm recoverable errors (partial-amnesia crash and pause-crash) as well as non-warm recoverable errors (amnesia crash) (page 58, column 3, lines 13-34). Cristian also teaches the importance of performance failures, specifically early timing failures and late timing failures (page 58, column 2, line 60 – column 3, line 7),

which teach the recovery rates for warm and non-warm recoverable errors when applied to the recovery procedures following crash failures.

59.   It would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to incorporate these failures and corresponding data into the system for modeling complex networks, such as distributed computing ensembles, because it was known that different errors had different characteristics and recovery procedures and a goal of modeling a complex system is to represent its performance as accurately as possible.

60.   The combination of these errors with the invention of Zager, et al. would be easily achieved by incorporating them as additional data in the root cause determination or performance degradation failure states, as well as the parameters and state data necessary to model the warm recoverable errors and non-warm recoverable errors. Incorporating such a feature into the invention of Zager et al. would produce a network model with higher fidelity regarding the actual complex network.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Proctor whose telephone number is (703) 305-0542 or (571) 272-3713 beginning in October 2004. The examiner can normally be reached on 8am-4pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin J Teska can be reached on (703) 305-9704 or

(571) 272-3716 beginning on October, 2004. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from

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direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-

free).

> Jason Proctor
> Examiner
> Art Unit 2123

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JEAN R HOMERE
PRIMARY EXAMINER